Communication in the Sky

Analysis of the Finnish Transport and Communications Agency's

Aviation Regulations 2022

Bachelor's thesis

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Tiivistelmä – Abstract

Turvallisen ilmailun perustana on selkeä kommunikaatio. Tämä käy ilmi siitä, että jopa 70 prosentissa ilmailuonnettomuuksista kommunikaatioon ja kielenkäyttöön liittyvät ongelmat ovat merkittävimpien tekijöiden joukossa. Vähentääkseen näitä onnettomuuksia ilmailuala panostaa erityisesti kolmeen periaatteeseen: puheen selkeyteen, hyvään kielitaitoon sekä ilmailun radiofraseologiaan. Näitä silmällä pitäen on laadittu kansainvälisiä säädöksiä, joiden testaamista ja toteutumista Suomessa valvoo Liikenne- ja viestintävirasto Traficom.

Tämä tutkielma keskittyy tarkastelemaan Traficomin vuoden 2022 alussa päivittämiä ilmailusäädöksiä kahden lento-onnettomuuden valossa, joissa kommunikaatioon ja kielenkäyttöön liittyvät ongelmat olivat keskiössä. Kyseessä on Quincyn lentokenttäonnettomuus vuonna 1996 sekä maailmankuulu Teneriffan turma vuonna 1977. Tavoitteena on selvittää, kuinka Traficom on ottanut turmien kommunikaatio-ongelmat huomioon nykyisissä säädöksissään, sillä ilmailualan tärkein tavoite on jatkuvasti lisätä ilmailun turvallisuutta ja oppia menneisyyden virheistä. Lisäksi, koska Suomen ilmailuturvallisuuden voidaan katsoa olevan huipputasoa, tutkielma pyrkii nostamaan esille mitä annettavaa juuri Suomella on ilmailumaana.

Tutkielma esittää kahden lentoturman kommunikaatioon ja kielenkäyttöön liittyvät ongelmat sekä etsii yhtäläisyyksiä ja eroavaisuuksia niiden ja Traficomin säädösten välillä. Kaikki data koostuu dokumenteista, jotka ovat internetissä ilmaiseksi saatavilla. Analyysi on tuotettu laadullisen sisällönanalyysin menetelmin, jonka avulla säädöksistä voitiin erotella neljä ongelmakategoriaa: virheet ilmailun radiopuhelinfraseologian käytössä, puutteellinen kielitaito, häiriöt radiopuhelinliikenteessä sekä epäselkeyden tai aksentin johdosta aiheutuneet väärinymmärrykset. Jokaista kategoriaa on liitetty ilmentämään otteita Traficomin säädöksistä tukemaan analyysiä.

Asiasanat – Keywords Traficom, aviation, communication, standard phraseology, language proficiency

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1. INTRODUCTION

Safe aviation is built on good communication, which comes apparent through the fact that up to 70% of aviation accidents contain human error with communication-related problems as underlying contributors (Helmreich and Foushee 1993, cited in Krivonos 2007: 3). In their effort to minimize the occurrence of these types of accidents, the aviation industry relies heavily on the principles of clarity in interaction, an adequate level of English proficiency, and use of standardized phraseology (Kim and Elder 2009, Krivonos 2007, Read and Knoch 2009), for which the International Civil Aviation Organization (ICAO) has established guidelines for (Alderson 2009: 168). Many countries, including Finland, have proceeded to create their own policies based on those provided by ICAO in order to test and monitor the principles listed above (Huhta 2009: 26.1). These guidelines are then supervised by the Finnish Transport and Communications Agency Traficom, which has recently published their updated aviation regulations at the beginning of 2022.

In the present thesis, I plan to assess these regulations set by Traficom in light of two famous air crashes involving serious communication problems: the Quincy Airport Disaster in 1996 that demanded the lives of 14 people (Aircraft accident report 2000: 1), and the most fatal aviation accident of all time; the Tenerife Disaster that took place in 1977 resulting in 583 casualties (Final report and comments… 1978: 24) . The aim of my study is to determine whether the current regulations of Traficom acknowledge the possibility of communication breakdowns that have led to fatal plane crashes in the course of history. Aviation safety is ensured by constantly looking for improvements, checking and double-checking operations as well as evaluating performance. In other words, the industry is determined to learn from each mistake, to which the present study also aims to contribute as there is not a similar one available at this time. In addition, by studying Traficom's regulations in specific, I hope to bring forth the possible benefits that Finland has to offer in this respect as a reputable aviation country (Aviation safety network 2023, Traficom 2022f).

2. BACKGROUND

2.1 The Significance of Communication in Aviation

Communication has a central and multifaceted role in building a foundation for safety in aviation together with other important flying skills (Krivonos 2007: 2-3). If effective and clear, communication will form the basis for other human factors involved in aviation, such as decision-making (Nevile 2006: 5). Kanki, Helmreich, and Anca (2010: 135) have presented how communication plays an indispensable part as a tool for gathering and sharing information, developing interpersonal relationships, creating predictability as well as managing and coordinating actions. Furthermore, Helmreich and Sexton (2000: 63) highlight how proper communication works closely in tandem with the skillful flying of an aircraft: the highest possible level of safety is dependent on the sufficient coexistence of the two.

The clarity in interaction becomes especially important when considering how expectations, assumptions, and jargon can lead to misunderstandings (Krivonos 2007: 5, 8). Billings and Cheaney (1981: 15, 90) have discovered that both pilots and air traffic controllers (ATC) have preconceived assumptions about their communication. Essentially, they hear things aligned with what usually happens in the aviation context at hand, which is also something that happened in the case of the Quincy Airport Disaster that I will present in section 2.3.1. Consequently, clear communication works to prevent flying crews from making these kinds of assumptions as it is comprised of active question-asking and using feedback (Krivonos 2007: 12-13). Asking questions in the form of, for instance, requesting clarifications is a simple indicator of a well-functioning crew, and using feedback is a crucial operation in any aviation environment. For example, cross-checking information transfer through repetition works to prevent the parties from forming assumptions by enhancing their ability to truly acknowledge what they hear (Billings and Cheaney 1981: 69). As will be presented in section 2.3.2, cross-checking information transfer, more specifically following the readback recommendations, might have made a difference in the Tenerife Disaster. Regarding jargon, Krivonos (2007: 12) determines it to be an either-or type of language use; it either enhances communication or appears almost as if an unfamiliar language would be suddenly added to the conversation. They call this the "Clear Only If Known" (COIK) -principle and emphasize that because of it, jargon is always advised to be used with caution (Krivonos 2007: 12).

2.2 English Proficiency and Standard Phraseology

Aviation English is classified as a language for specific purposes. A great amount of it can be compressed into particular choices in language use that allow both L1 and L2 users of English to communicate effectively, especially in international aviation (Alderson 2009: 169). This form of language use, called standard phraseology, is particularly prominent between pilots and ATC. It is used mainly to communicate important flying information, such as altitudes and headings. However, in non-routine circumstances such as emergencies, the parties might get exposed to situations that require them to use "plain English", which means communicating in fluent English about any and all aviation-related matters. This is dependent on a good level of English proficiency from both sides as comprehensibility and clarity are always the main objectives of aviation communication (Alderson 2009: 171, Read and Knoch 2009: 2).

English proficiency requirements in ICAO member countries, including Finland, are based on their Language Proficiency Rating Scale published in 2004 (Alderson 2009: 168), in which skills equal to level 4/6 are the minimum requirement for both pilots and ATC personnel (Alderson 2009: 172, Traficom 2022d: 1). The skill level is determined by evaluating competence in different areas of language use including pronunciation, structure, vocabulary, fluency, comprehension, and interactions. ICAO recommends level 4 candidates be tested every three years, whereas candidates with level 6 proficiency have a permanent license (Alderson 2009: 172). Originally, ICAO outsourced the authoritative government agency of each country to implement their orders by 2008, but the deadline had to be postponed till 2011 due to delays (Alderson 2009: 168). In Finland, the agency appointed for this was Traficom, which is also responsible for overseeing the regulations today.

In 2022, Traficom (2022a) proceeded to specify their requirements due to detecting it necessary after evaluating their implementations and receiving feedback from language testing experts. Since the aviation industry aspires to constant development, this update provided the perfect opportunity to evaluate the current safety situation of Finnish aviation. In the following section, I will present the two plane crashes' communication problems to set up the analysis later in this thesis. While the crashes are relatively old (1977 and 1996) contrary to the regulations (2022), there is no explicit comparison between them available at this time, rendering the present study worthwhile.

2.3 Problems in Communication

In this section, I will present the two plane crashes involving significant communication breakdown: the Quincy Airport Disaster and the Tenerife Disaster. It is to be noted that both these incidents, similar to the majority of aviation accidents, were affected by numerous factors from poor visibility to several routine flying procedures getting disregarded, to name a few. However, for the purpose of this thesis, I will focus solely on the communication and language-related problems that contributed to the crashes.

2.3.1 Quincy Airport Disaster

The Quincy Airport Disaster in 1996 at Quincy Municipal Airport, Illinois, involves three planes: flights 5925 by United Express and King Air A90, which collided when United Express was landing and the King Air was about to take off, as well as a Piper Cherokee that was waiting their turn to take off after the King Air (Aircraft accident report 2000: 1). In their Aircraft accident report (2000: 24), National Transportation Safety Board determined the main communicational problems contributing to the crash to include an inability to execute several aviation principles sufficiently, inadequate use of standard phraseology and radio transmission interference. In their regulations, Traficom emphasizes the importance of phraseology adamantly, whereas crews' ability to react appropriately in the event of radio interference is barely addressed. This will be elaborated on in the analysis section.

According to the Code of federal regulations (1999: 201), landing planes have a right-of-way over departing ones, so King Air was expected to focus heavily on getting a clear runway – announcement from the United Express crew and clearly communicate their departure. This is even more important in airports without an ATC tower, such as Quincy (Air traffic organization policy 2015: 200). Unfortunately, King Air failed in this dual mission. While on final approach, the United Express requested one more last-minute confirmation that they would have a clear runway, or in other words, that the King Air was holding, but the King Air crew did not answer them (Aircraft accident report 2000: 111). It is highly probable that King Air's pilot-in-command did not clearly announce their departure because of simple carelessness and being distracted by teaching the pilot trainee on board (Aircraft accident report 2000: 68-69). Essentially, there was too much time (approximately one minute) between their announcement to use the runway in question and initiating the actual take-off roll. Moreover, this kind of behavior goes against the basic aviation principle of "see and

avoid" (Aircraft accident report 2000: 77), and as mentioned earlier, visual scanning forms an indispensable base for safe communication, especially in unattended airports.

Due to the fact that the United Express did not receive a response, the pilot of the third plane (the Piper Cherokee) heard the request and announced that they were waiting in line. This demonstrates a lack of situational awareness from the Cherokee pilot as it is inappropriate for planes that are waiting in line to interfere with the communication between planes taking off and landing because of risking just this type of confusion (Aircraft accident report 2000: 71).

More importantly, the Cherokee pilot failed to include their plane type in their radio message. In their Aeronautical Information Manual or AIM (2021: 221), the Federal Aviation Administration states that: "[c]ivil aircraft pilots should state the aircraft type, model or manufacturer's name followed by the digits/letters of the registration number". Despite this, the Cherokee pilot announced: "Seven six four six Juliet uh, holding uh, for departure on runway four….", and ended their sentence seven seconds later with: ".... * on the uh, King Air", thus leaving out "Cherokee", resulting in the only plane type being heard by the United Express crew to be "King Air" (Aircraft accident report 2000, Appendix B: 87). Moreover, the seven seconds in between the utterances include the inaudible word "behind" (due to radio interference caused by an automated notification from the Ground Proximity Warning System or GPWS) just before the "King Air". This makes it more than understandable that the United Express crew were left with the impression that it was the King Air holding (Aircraft accident report 2000, Appendix B: 87). Had they heard the indicator "Cherokee", they might have requested for clarification on who it actually was that was holding.

In their Aircraft accident report (2000: 66-67), the National Transportation Safety Board determined the United Express crew's actions satisfactory when all aspects of the situation are taken into account. They did a great job of frequently communicating with the planes on the ground as they were using a more uncustomary approach, and could have reasonably been expected to get understood and corrected in their belief that they were communicating with King Air. Nevertheless, the report also brings up that it would have been desirably cautious for them to ask the responding Cherokee pilot to repeat their message that was interrupted by the GPWS (Aircraft accident report 2000: 67). Consequently, it comes apparent here that the United Express crew's focus was much more in getting a response in the first place than in the actual contents of the response. In other words, they were working based on assumptions. This is backed up later in the report when it is mentioned that the crew likely paid less

attention to the planes on the ground after making their assumption (Aircraft accident report 2000: 67). As discussed in section 2.1, assumptions are dangerous in aviation, which is not stressed enough in Traficom's regulations. This will be further elaborated in the analysis section.

2.3.2 Tenerife Disaster

Probably the most well-known aviation accident involving communication errors is the Tenerife Disaster in 1977 at Los Rodeos Airport, Tenerife. Flights 4805 by Royal Dutch Airlines (KLM) and 1736 by Pan American World Airways (Pan Am) hit each other when the KLM was taking off from a runway where the Pan Am was still taxiing (Final report and comments… 1978: 2-4, Cookson 2009: 22.8). The main communication problems that contributed to the collision were misunderstandings, radio transmission interference and inability to follow the readback recommendations (Final report and comments… 1978: 34-35). In their regulations, Traficom mentions the ability to correct misunderstandings only once, and does not address the readback recommendations explicitly at all. Similar to the Quincy Disaster discussed, these too will be elaborated on in the analysis section.

At an earlier stage of the accident (several minutes before impact) the Pan Am crew had trouble understanding the taxiing instructions from the ATC. It should be noted that it is an unconventional procedure to taxi on an occupied runway, but on that particular day the airport was unusually congested. The ATC spoke with a Spanish accent that caused the Pan Am crew difficulty to determine whether their destined runway exit was the "first" or the "third" (Cookson 2009: 22.9-22.10). Although this confusion was resolved relatively quickly, it still took some valuable minutes, thus prolonging the time that Pan Am spent on the runway in front of KLM (Final report and comments… 1978: 28-30). In today's increasingly international climate, comprehensible accents are more important than ever, which will be further discussed in the analysis section.

While this was happening, the KLM crew was taking off without a clearance. Their utterance: "We are now at take-off" rose to the center of the investigation along with the ATC's response: "Ok, … stand by for take-off… I will call you" (Final report and comments… 1978: 27). The first was determined as ambiguous language use as it did not alert the ATC to realize that the KLM was actually beginning their take-off roll; rather it was perceived by the controller that they were "at take-off **position**" despite the fact that later inspection of the

cockpit voice recorders revealed that no such word was used (Final report and comments… 1978: 41). In addition, it is stated in the Air traffic organization policy (2015: 185) that controllers should avoid using the term "take-off" in any other cases than those that have to do with the actual take-off clearance.

To make matters worse, the ATC's instructions for KLM were not clearly heard by them because a four-second transmission disruption occurred as the Pan Am tried to announce their position on the runway to the tower at that same time (Final report and comments… 1978: 33). It is confirmed in the accident report that the KLM crew was the only party who heard the squeaking sound caused by the simultaneous messages (Final report and comments… 1978: 43), meaning that the other two did not realize they were speaking at the same time, so it would not have been possible for them to correct the situation based on the sound. However, Weick (1990: 13) has pointed out that had the controller verified that their instructions were understood and read back to them, it might have helped. At the time there was also fog accumulating, which only makes the ability to function without visual cues that much more important (Final report and comments… 1978: 42). As the analysis section will show, the importance of functioning solely based on voice can be argued not to be sufficiently accounted for in Traficom's regulations.

3. AIM AND RESEARCH QUESTION

The present study focuses on assessing the extent to which the current aviation regulations in Finland take into consideration the language- and communication-related problems that have resulted in fatal accidents in the past. I have chosen Finland as the target country of my study due to its reputation as an extremely safe aviation country (Aviation safety network 2023). In addition, I hope to point out the possible shortcomings in the regulations as well as their merit for the industry. Consequently, I ask: how are the language- and communication-related problems of the two air crashes presented in this thesis accounted for in Traficom's 2022 aviation regulations?

4. DATA AND METHODS

4.1 Data and Data Collection

My main data consists of the aviation regulations by Traficom, which are available as documents on Traficom's (2022a) website. Consequently, the data was easy and free to access, which is just one of the multiple benefits that documentary research provides (Denscombe 2014). Government documents are a valid source of objective and factual information that retain their meaning as well as their societal significance and value for decades. This is because they are, on most occasions, compatible with the basic document assessment criteria presented by Denscombe (2014: 6), which include authenticity, representativeness, meaning, and credibility. In other words, Traficom's aviation regulations are from a reliable government source and have been carefully prepared to be unambiguous and stay true to their purpose. As for the accident reports, they were chosen based on their authors, both of which are government agencies. This makes them the original versions and thus authentic and reliable sources of information. For the time being, the regulations are available only in Finnish and the accident reports I have utilized in the study are in English.

Traficom presents two regulations, PEL M2-92 and PEL M2-93, concerning the language proficiency requirements and assessment as well as restricted radiotelephony authorization (Traficom 2022b, 2022c). In addition, both regulations have separate rationales (Traficom 2022d, 2022e) that elaborate on the contents of the main documents. Overall, the regulations consist of requirements regarding Finnish and English proficiency, adequate use of radiotelephony and phraseology, and the approved manners of testing these with the development of remote testing becoming possible in some aspects. PEL M2-92 concerns licensed airplane and helicopter pilots, air traffic controllers and ATC students, flight informants (working in Aerodrome Flight Information Service or AFIS instead of ATC), language proficiency inspectors as well as other aviation operators aspiring to gain, extend or renew their language proficiency certificate (Traficom 2022b, 2022d: 1). PEL M2-93, on the other hand, concerns all the aviation operators listed above who use the aviation radiotelephone with the exception of personnel using it to communicate internally on frequencies reserved for such use. These are typically situations where airplanes are grounded or the personnel in question do not engage directly with pilots or ATC, for example in technical assistance services where the standard phraseology is not demanded (Traficom 2022e: 3).

4.2 Method of Analysis: Qualitative Content Analysis

Documentary research is not about reading a document, but rather about interpreting it (Denscombe 2014: 1-2), which is why I have chosen to approach the regulations with the means of qualitative content analysis. This method seeks to understand causal connections between events and phenomena in order to apply them to the relevant larger context (Flick 2014: 170, 173). Essentially, I am looking for similarities and differences between the regulations and the air accident reports. Flick (2014: 171) highlights how qualitative content analysis is a particularly good choice for the kind of comparison I have executed between the data due to the possibility to focus on details and immerse oneself in the meanings that can be discovered. Moreover, according to them (Flick 2014: 181) as well as Grbich (2013: 5), the method is especially suitable for studying text-based documents derived from historical events and phenomena, making it an obvious choice for my study.

Following the framework presented by Flick (2014: 170-171), the air crash reports were studied in detail to recognize the main problems regarding language use and communication in aviation. After this, the Traficom regulations were systematically analyzed to map out which categories are accounted for and how. As a result, four distinct categories of communication problems were identified, which I will present and discuss in the following section.

5. ANALYSIS

The four communication problem categories identified in this study include inadequate use of standard phraseology, nonproficient language use, radio transmission interference, and misunderstandings due to unclear or accented speech. In addition, the analysis yielded information about errors in carrying out basic communication principles of aviation, which I will discuss in relevant parts. Examples derived from the regulations will be presented to support the analysis of each category.

5.1 Inadequate Use of Standard Phraseology

As stated by Alderson (2009: 169), the use of standard phraseology in aviation serves to enable unambiguous communication mostly between pilots and ATC, especially in

international aviation. Its purpose is to provide both L1 and L2 speakers of English with the required terminology to communicate effectively by saving time and making sure that the intended message is conveyed in all circumstances.

In the case of the Quincy Disaster, the pilot of the third plane involved (the Piper Cherokee) forgot to include their plane type in their radio message, resulting in a confusing situation for the pilots of the United Express. When examining Traficom's regulations, the importance of being knowledgeable on the phraseology is brought up on several occasions. It is ordered in PEL M2-92 rationale (Traficom 2022d: 6) that the maximum language proficiency level of 6 neither in Finnish nor English is adequate as it does not guarantee knowledge of the standard aviation phrases. In such instances, the certificates should not be granted at all (Examples 1-2).

> Example 1. *"Kohta 5.2.3: Kohtaan on lisätty vaatimus siitä, että kielitaitotarkastajan suorittamassa haastattelussa on tarkastettava myös radiopuhelinfraseologian osaaminen. Tarkoituksena on varmistaa, ettei suomen kielen kielitaitomerkintää myönnetä ilman että selvitetään, hallitseeko henkilö suomenkielisen radiopuhelinliikenteen vakiosanonnat."*

"Section 5.2.3: It has been added to the section that the interview conducted by the language proficiency inspector is required to include the testing of radiophone phraseology. This is to ensure that a candidate is not granted a language proficiency certificate without checking whether they are knowledgeable on the standard phraseology in Finnish."

> Example 2. *"Kohta 5.3.3: Kohtaan on lisätty vaatimus siitä, että kielitaitotarkastajan suorittamassa haastattelussa on tarkastettava myös radiopuhelinfraseologian osaaminen. Tarkoituksena on varmistaa, ettei englannin kielen kielitaitomerkintää myönnetä edes syntyperäiselle tai kielitaidoltaan syntyperäistä vastaavalle englannin puhujalle ilman että selvitetään, hallitseeko henkilö englanninkielisen radiopuhelinliikenteen vakiosanonnat."*

"Section 5.3.3: It has been added to the section that the interview conducted by the language proficiency inspector is required to include the testing of radiophone phraseology. This is to ensure that not even a native or a native-level speaker of English is granted a language proficiency certificate without checking whether they are knowledgeable on the standard phraseology in English."

The point of Examples 1-2 is further emphasized in relation to Finnish phraseology in Example 3 from PEL M2-93 rationale (Traficom 2022e: 5).

> Example 3. *"Yleinen suomen kielen osaaminen ei riitä, vaan lentoturvallisuussyistä on varmistettava, että kelpuutus myönnetään vain sellaiselle henkilölle, joka osaa käyttää oikein ilmailun radiopuhelinliikenteen vakiosanontoja suomeksi."*

"General knowledge of the Finnish language is not sufficient. Due to flight safety matters, it must be ensured that the authorization is granted only for those knowledgeable on using the Finnish radiophone phraseology correctly."

In addition, Traficom (2022d: 6-7) orders that should a training flight fail to provide enough practice on the phraseology, it should be simulated.

Based on these frequent statements it is safe to say that Traficom places a great emphasis on aviation safety in regard to phraseology. However, Traficom (2022b: 2) has also approved radiotelephony usage for ATC or AFIS trainees **under supervision**, whereas the same right applies to aspiring pilots even if they fly alone. Traficom does state that this kind of solo flight training has to be a part of an approved training program, but it leaves the question open of what kind of programs are allowed. Furthermore, in the case of the Quincy Disaster, the Cherokee pilot had 80 hours of flight time under their belt (Aircraft accident report 2000: 47, 26), so they were considered fairly inexperienced. The other passenger/pilot on board had even less, only 44 hours, which only adds to the questionability of Traficom's policy.

5.2 Nonproficient Language Use

At the foundation of skillful radiotelephone use is language proficiency, which Traficom (2022b: 2) orders to be assessed either through an exam, inspection, or interview. These options are used slightly differently for different operators and are affected by some circumstantial factors, such as the purpose of the candidate's assessment or the type of their aviation license.

The exam includes radio phraseology and listening comprehension tests. It is used to evaluate pronunciation, vocabulary, structures, fluency, and interaction (Traficom 2022b: 6) with proficiency levels 4-6 approved as sufficient by all other aviation operators except language proficiency inspectors, who are required to obtain the minimum level 5 (Traficom 2022b: 8, 2022d: 1). The tested areas are in line with ICAO's Language Proficiency Rating Scale

(Alderson 2009: 172), and there is a remote option being planned for this in the future (Traficom 2022b: 3). The language proficiency inspection, on the other hand, refers to a more practical approach conducted in unison with flight or other training.

Lastly, the interview is designed to test the ability to communicate clearly, fluently, and precisely even in unfamiliar and unexpected situations by using appropriate plain language in addition to phraseology (Example 4).

> Example 4. *"6.2.1… Aiheisiin on kuuluttava normaalista ilmailutoiminnasta poikkeavien tilanteiden hallintaa ja keskusteluun on sisällyttävä odottamattomia käänteitä, joihin tarkastettava ei voi ennalta valmistautua. Keskustelu ei saa sisältää pelkästään radiopuhelinliikenteen fraseologiaa, vaan sen on mitattava tarkastettavan kykyä keskustella yleisistä ja ilmailuun liittyvistä aiheista riittävän täsmällisesti, sujuvasti, selkeästi ja ymmärrettävästi."* (Traficom 2022b: 5).

"6.2.1… The topics must cover managing non-routine circumstances and unexpected turns of events must be incorporated into the conversation. The oral assessment cannot focus solely on the radiophone phraseology, rather its purpose is to test the candidate's ability to engage in a conversation about general and aviation-related topics accurately, fluently, clearly, and intelligibly."

As discussed earlier in section 2.2, plain language, or the ability to have a mutually comprehensible and clear conversation about everything flying-related in the target language, is always required. Level 6 proficiency both in Finnish and English is granted for native or native-level speakers by interviewing them if the inspector is authorized by Traficom (2022b: 4). Otherwise, or in the case of an unsuccessful interview, the exam is required. Referring back to Read and Knoch (2009: 2) as well as Alderson (2009: 171), the interview's purpose is highly important, especially in the light of the Tenerife case. It proved just how crucial it is for the parties to be able to communicate clearly in uncustomary situations, such as taxiing on an occupied runway (Final report and comments… 1978: 29).

5.3 Radio Transmission Interference

Radio interference played a crucial role in both crashes (Aircraft accident report 2000: 24, Final report and comments… 1978: 34-35). As presented in section 2.3, the interference in the Quincy case caused a misconception about the identity of the interlocutor, and the interference in the Tenerife case together with the deteriorated visibility forced the parties to

cope solely based on voice. What is paramount is to consider how aviation crews can deal with these kinds of unexpected interferences that are mechanical in nature and thus out of their control.

The misconception in the Quincy case led the United Express crew to form assumptions. Traficom (2022d: 6) brings up the issue of assuming only in relation to making sure that personnel with the highest level of language proficiency are not automatically assumed to know the phraseology as well. Referring back to Krivonos (2007: 6-7); assumptions should never be made in aviation, which together with the warning example of the Quincy Disaster can be seen to call for improvements from Traficom in regards to assumption-related errors in aviation.

As far as functioning in voice-based situations is concerned, Traficom (2022b: 5) does address them but only briefly (Example 5).

> Example 5. *"6.1.2... Tarkastettavan on osoitettava, että hän kykenee kielen avulla viestimään tehokkaasti pelkästään ääneen perustuvissa tilanteissa (puhelin/radiopuhelin)..."*

"6.1.2… The candidate must demonstrate their ability to communicate in situations solely based on voice (telephone/radiophone)..."

Such situations are additionally emphasized by ICAO and the EU (Traficom 2022d: 6). Nevertheless, it can be argued based on the present study that they should be highlighted even more in the regulations. One of the desired operations that Traficom can be interpreted to encourage is what the KLM crew in the Tenerife case failed to do: inform the other parties that the radio message was disrupted or ask them to repeat (Final report and comments… 1978: 46), yet Traficom does not explicitly instruct this.

5.4 Clarity of Communication: Misunderstandings and Accents

Effective and clear communication is at the heart of aviation safety (Helmreich and Sexton 2000, Kanki et al. 2010: 135, Nevile 2006: 5). However, ambiguous or unclear meanings can be found especially in the Tenerife case, while Traficom addresses them very little.

In the regulations, misunderstandings are brought up only once (Traficom 2022b: 5). This can be found in PEL M2-92 (Example 6) where Traficom states that an ability to correct them is demanded.

Example 6. *"6.1.2… Tarkastettavan on osoitettava, että hän kykenee kielen avulla…*
oikaisemaan väärinkäsityksiä…"

"6.1.2… The candidate must demonstrate their ability to use language… to correct
misunderstandings…"

It was deduced in Netherlands Aviation Safety Board's investigation (Final report and
comments… 1978: 41) that the ATC's response to KLM could have optimally been followed
with them expecting a confirmation and not moving on without it, which might have
prevented the misunderstanding from forming. It is also reinforced by Krivonos (2007: 13),
Billings and Cheaney (1981: 69) as well as in the AIM (2021: 262) that readbacks and
acknowledgments of instructions reduce communication-related accidents. Based on these
strong recommendations, it would be advisable for Traficom to address the readback
recommendations more explicitly.

In the same section of PEL M2-92 (Example 7), Traficom (2022b: 5) orders that a dialect or
an accent used in aviation should always be "generally comprehensible".

Example 7. *"6.1.2… Tarkastettava on osoitettava… että hänen käyttämänsä murre*
tai korostus on ilmailuyhteisössä yleisesti ymmärrettävä."

"6.1.2… The candidate must demonstrate that their dialect or accent is generally
comprehensible in conformation to the aviation industry's standards."

In light of the Tenerife case where the Pan Am crew's difficulty to understand the ATC's
instructions took away some valuable time, the term "generally comprehensible" is
problematic. It remains unclear, at least to the extent that the regulations are concerned, as to
which accents fall under this category. After all, the controller of the Tenerife case was
comprehensible as they were eventually able to work well together with the Pan Am crew in
resolving the situation, but the minutes spent on that exchange might have affected the
resulting scenario crucially. For this part, Traficom's regulations are alarmingly vague. They
clearly spell out that a speaker must be "generally comprehensible", but such a vague term
entails the possibility of aviation personnel having an accent feature that has been proven to
have played a part in notable misunderstandings in the past.

6. CONCLUSION

For the present study, my research question was: how are the language- and communication-related problems of the two air crashes presented in this thesis accounted for in Traficom's aviation regulations of 2022? The study revealed that Traficom places a great emphasis on the importance of aviation phraseology and radiotelephony by addressing them on several occasions; the critical point to be taken from this is that even excellent language skills do not equal skillful radiotelephone use. On the other hand, the aviation personnel's ability to correct misunderstandings and function under unexpected circumstances, such as radio transmission interferences, was discussed relatively little and in a manner that leaves room for some speculation. Moreover, clarity of communication and regulations concerning accented speech was addressed only vaguely.

Key strengths of the study include using Finland as a reference point and assessing current data. Finland is a reputable aviation country with a clean safety record, and the Traficom regulations were quite recently updated. On the downside, the study was very small scale focusing solely on the regulations, thus leaving out all the practical implementations. Furthermore, as a language expert student, I am not equipped with the same level of knowledge as experts working in the field of aviation, so my view is understandably very limited.

The present study offered new insight into the current safety situation of Finnish aviation. Communication is essential in all aviation contexts because communication-related issues alone account for a remarkable percentage of aviation accidents. Consequently, it is a field that requires constant study and improvement, to which also the present study aimed to contribute. It was proved in this study that while it is justified to question the use of relatively old accidents as subjects of comparison, the analysis managed to yield new information. Development is an ongoing process, so while some of the effects of the accidents are visible in the 2022 regulations, there is still work to be done. However, as the regulations do not offer an exhaustive description of the relevant aspects of aviation communication, future research could perhaps focus on how the regulations are reflected in practice, and what consequences the constantly expanding remote testing options have. In addition, an international study designed to compare the regulations of different ICAO member countries could provide even more insight into how they are utilized in aviation training and testing.

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